SPHERICAL BLOWOUT PREVENTER WITH ENERGIZEABLE PACKER SEAL AND METHOD OF USING SAME

CROSS-REFERENCE TO RELATED APPLICTIONS

[0001] The application claims priority to US Non-Provisional Application No. 14/229,268, filed on March 28, 2014, the entire contents of which is hereby incorporated by reference herein.

BACKGROUND

[0002] The present disclosure relates generally to techniques for performing wellsite operations. More specifically, the present invention relates to techniques, such as sealing and/or severing a tubular at the wellsite, for preventing blowouts.

[0003] Oilfield operations may be performed to locate and gather valuable downhole fluids. Oil rigs are positioned at wellsites, and downhole tools, such as drilling tools, are deployed into the ground to reach subsurface reservoirs. Once the downhole tools form a wellbore (or borehole) to reach a desired reservoir, casings may be cemented into place within the wellbore, and the wellbore completed to initiate production of fluids from the reservoir. Tubulars may be positioned in the wellbore to enable the passage of subsurface fluids to the surface.

[0004] Leakage of subsurface fluids may pose an environmental threat if released from the wellbore. Equipment, such as blow out preventers (BOPs), may be positioned about the wellbore to form a seal about a wellbore to prevent leakage of fluid therefrom. Various types of BOPs, such as ram, spherical, annular, etc., may be used. For example, BOPs may have rams with blades to sever and/or seal the wellbore, or employ a spherical configuration. Some examples of BOPs are provided in U.S. Patent/Application Nos. 5588491 and 5662171, the entire contents of which are hereby incorporated by reference herein.

SUMMARY

[0004a] According to a first aspect, there is provided a seal assembly of a blowout preventer for sealing a wellbore penetrating a subsurface formation, the blowout preventer having a housing with a fluid path therethrough in fluid communication with the wellbore, the seal assembly comprising: a piston slidably positionable in the housing, the piston having a hole therethrough in fluid communication with the fluid path; and a packer element comprising a plurality of fingers and a packer seal, each of the plurality of fingers comprising a housing portion and a piston portion, the housing portion slidably movable along the housing and the

piston portion slidingly movable along the piston, the plurality of fingers engageable by the piston and movable to a sealed position about the flow path whereby the packer seal is selectively energizable to form a seal about the blowout preventer.

[0004b] According to a second aspect, there is provided a blowout preventer for sealing a wellbore penetrating a subsurface formation, the blowout preventer comprising: a housing having a flow path therethrough in fluid communication with the wellbore; and a sealing assembly positionable in the housing about the flow path, the sealing assembly comprising: a piston slidably positionable in the housing, the piston having a hole therethrough in fluid communication with the fluid path; and a packer element comprising a plurality of fingers and a packer seal, each of the plurality of fingers comprising a housing portion and a piston portion, the housing portion slidably movable along the housing and the piston portion slidingly movable along the piston, the plurality of fingers engageable by the piston and movable to a sealed position about the flow path whereby the packer seal is selectively energizable to form a seal about the blowout preventer.

[0004b] According to a third aspect, there is provided a method of forming a seal about a wellbore penetrating a subsurface formation, the system comprising: disposing a spherical blowout preventer about the wellbore, the blowout preventer comprising: a housing having a flow path therethrough in fluid communication with the wellbore and a sealing assembly positionable in the housing about the flow path, the sealing assembly comprising: a piston slidably positionable in the housing, and a packer element comprising a plurality of fingers and a packer seal, each of the plurality of fingers comprising a housing portion and a piston portion; and energizing the packer seal to form a seal about the blowout preventer by slidingly engaging the piston portion of the plurality of fingers with the piston and moving the piston portion to a sealed position about the flow path.

[0005] In ~~at least one aspect~~ one embodiment, the disclosure relates to a seal assembly of a blowout preventer for sealing a wellbore penetrating a subsurface formation. The blowout preventer has a housing with a fluid path therethrough in fluid communication with the wellbore. The seal assembly includes a piston slidably positionable in the housing and a packer element. The piston has a hole therethrough in fluid communication with the fluid path. The packer element includes a plurality of fingers and a packer seal. Each of the fingers includes a housing

portion and a piston portion. The housing portion is slidably movable along the housing and the piston portion slidingly movable along the piston. The fingers are engageable by the piston and movable to a sealed position about the flow path whereby the packer seal is selectively energizable to form a seal about the blowout preventer.

[0006] The curved portion may be pivotally connectable to the piston portion. A movement portion of the piston may be slidably positionable in a piston cavity of the housing. The piston portion may be slidably engageable with a sliding surface of the piston. The housing portion may include an elongate body with a pointed tip at an end thereof. The fingers may have at least one inlet extending therein, and the packer seal may be extrudable about the at least one inlet. The fingers may have a variable gap therebetween. The packer seal may be extrudable about the fingers to form a seal with the housing and the piston. The packer seal may be molded about the fingers. The packer seal may have an inner surface convergable to form a seal with one of itself and a tubular of the wellbore.

[0007] In another ~~aspect~~ embodiment, the disclosure relates to a blowout preventer for sealing a wellbore penetrating a subsurface formation. The blowout preventer includes a housing having a flow path therethrough in fluid communication with the wellbore and a sealing assembly positionable in the housing about the flow path. The seal assembly includes a piston slidably positionable in the housing and a packer element. The piston has a hole therethrough in fluid communication with the fluid path. The packer element includes a plurality of fingers and a packer seal. Each of the fingers includes a housing portion and a piston portion. The housing portion is slidably movable along the housing and the piston portion slidingly movable along the piston. The fingers are engageable by the piston and movable to a sealed position about the flow path whereby the packer seal is selectively energizable to form a seal about the blowout preventer.

[0008] The housing may include a wellbore portion operatively connectable to a wellhead and a riser portion operatively connectable to a riser. The housing may include a riser portion, a wellbore portion, and a housing ring. The housing may have a cavity therein to receive at least a portion of the seal assembly. The housing may have a curved inner surface engageable by the housing portion. The housing may be positionable about a tubing of the wellbore. The blowout preventer may also include a pressure source to drive the piston. The seal assembly may be operatively connectable to a controller.

[0009] ~~Finally, in~~ In another ~~aspect~~ embodiment, the disclosure relates to a method of forming a seal about a wellbore penetrating a subsurface formation. The method involves disposing a spherical blowout preventer about the wellbore. The blowout preventer includes a housing having a flow path therethrough in fluid communication with the wellbore and a sealing assembly positionable in the housing about the flow path. The sealing assembly includes a piston slidably positionable in the housing, and a packer element comprising a plurality of fingers and a packer seal. Each of the fingers includes a housing portion and a piston portion. The method also involves energizing the packer seal to forming a seal about the blowout preventer by slidingly engaging the piston portion of the fingers with the piston and moving the piston portion to a sealed position about the flow path.

[0010] The method may also involve retracting the packer seal to a retracted portion defining a desired diameter therein. The energizing may involve closing the flow path by compressing the packer seal with the fingers, supporting the packer seal by extending the piston portion towards the flow path a distance beyond an inner surface of the piston, converging tips of the housing portion of the fingers and/or tips of the piston portion of the fingers to define a reduced a diameter therebetween, supporting the packer seal in the sealed position by compressing the packer seal between the housing portion and the piston portion with the fingers, supporting the packer seal in an unsealed position by retracting the fingers, compressing the packer seal against an inner surface of the housing, compressing the packer seal between the piston portion and the piston, and/or self-sealing the packer seal by converging an inner surface of the packer seal together to close an inner diameter thereof.

[0011] The method may also involve disposing the tubular through the flow path, forming a seal about the blowout preventer by forming a seal about the tubular, and/or establishing fluid communication between a riser and the wellbore via the fluid path. The energizing may also involve slidably moving the housing portion along the housing and the piston portion along the piston, engaging the fingers with the piston, moving the fingers to a sealed position about the flow path, and/or moving the piston by selectively applying pressure to the piston. The disposing may involve operatively connecting a wellbore end of the housing to the wellbore and a riser end of the housing to a riser.

BRIEF DESCRIPTION DRAWINGS